UNITED STATES PATENT AND TRADEMARK OFFICE

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 June 2006*.
2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.
3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.
    4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5)☐ Claim(s) _____ is/are allowed.
6)☒ Claim(s) *1-16* is/are rejected.
7)☐ Claim(s) _____ is/are objected to.
8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.
10)☒ The drawing(s) filed on *22 June 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.
    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
    a)☒ All   b)☐ Some * c)☐ None of:
      1.☒ Certified copies of the priority documents have been received.
      2.☐ Certified copies of the priority documents have been received in Application No. _____.
      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 10-11 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claim 10 recites wherein the low order z-buffer memory is physically separable from the three-dimensional shape drawing device; this is not disclosed in the specification. Claim 11 recites the high order bits and the low order bits being separated as different bit strings; this is not disclosed in the specification.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-5, 7-8, and 12-15 are rejected under 35 U.S.C. 102(b) as being anticipated by Dowdell (U.S. Patent No. 5,301,263).

With respect to claim 1, Dowdell discloses a three-dimensional shape drawing device (column 7, lines 47-58, system in Fig. 3) for drawing a three-dimensional shape

by using Z buffer algorithm, the three-dimensional shape drawing device comprising: a

depth value calculation section for calculating a depth value of a pixel to be drawn

(column 3, lines 52-54, computer calculates new z-value); a high order Z-buffer memory

for retaining high order bits of a depth value of a pixel to be displayed as a front face,

the depth value being among depth values having been calculated by the depth value

calculation section (column 4, lines 45-50, most significant bytes from z-buffer memory);

a low order Z-buffer memory for retaining low order bits of the depth value of the pixel to

be displayed as the front face, the depth value being among the depth values having

been calculated by the depth value calculation section (column 4, lines 45-50, middle

significant and least significant bytes from z-buffer memory); a high order bit comparing

section for reading the high order bits retained by the high order Z-buffer memory and

comparing the high order bits with high order bits of the depth value calculated by the

depth value calculation section (column 4, lines 61-68, column 5, lines 1-14, comparator

114 in Fig. 1 compares old and new z-values); a low order bit comparing section for,

when a result of a comparison performed by the high order bit comparing section shows

that the high order bits of the depth value calculated by the depth value calculation

section have a same value as that of the high order bits of the depth value retained by

the high order Z-buffer memory, reading the low order bits of the depth value retained

by the low order Z-buffer memory and comparing the low order bits with low order bits of

the depth value calculated by the depth value calculation section (column 5, lines 15-41,

comparing lower order bits if high order bits are equal); and a record update section for,

when the result of the comparison performed by the high order bit comparing section

shows that a depth indicated by the high order bits of the depth value calculated by the depth value calculation section is shallower than a depth indicated by the high order bits of the depth value retained by the high order Z-buffer memory, updating the high order bits of the depth value retained by the high order Z-buffer memory and the low order bits of the depth value retained by the low order Z-buffer memory by using the depth value calculated by the depth value calculation section (column 5, lines 5-10, updating the entire 24 bit new z-value), and for, when a result of a comparison performed by the low order bit comparing section shows that a depth indicated by the low order bits of the depth value calculated by the depth value calculation section is shallower than a depth indicated by the low order bits of the depth value retained by the low order Z-buffer memory, updating the low order bits retained by the low order Z-buffer memory by using the depth value calculated by the depth value calculation section (column 5, lines 19-23, column 5, lines 33-36).

With respect to claim 2, Dowdell discloses the three-dimensional shape drawing device according to claim 1, further comprising: a pixel value calculation section for calculating a pixel value which is information about the pixel to be drawn (column 8, lines 59-68, color update unit 314); and an image memory for retaining the pixel value calculated by the pixel value calculation section (column 9, lines 1-3, frame buffer 315).

With respect to claim 3, Dowdell discloses the three-dimensional shape drawing device according to claim 2, wherein the pixel value calculation section calculates the pixel value when the result of the comparison performed by the high order bit comparing section shows that the depth indicated by the high order bits of the depth value

calculated by the depth value calculation section is shallower than the depth indicated

by the high order bits of the depth value retained by the high order Z-buffer memory and

when the result of the comparison performed by the low order bit comparing section

shows that the low order bits of the depth value calculated by the depth value

calculation section have a same value as that of the low order bits of the depth value

retained by the low order Z-buffer memory (column 8, lines 12-21, as a result of whether

or not the new z-value has replaced the old z-value, lines 59-62).

With respect to claim 4, Dowdell discloses the three-dimensional shape drawing

device according to claim 1, wherein the low order bit comparing section updates the

low order bits retained by the low order Z-buffer memory when the low order bits

calculated by the depth value calculation section have the same value as that of the low

order bits retained by the low order Z-buffer memory (column 5, lines 38-41, in the case

where the old 24 bit z-value is equal to the new 24 bit z-value, the new value is equal to

the old value and already written to memory, thus the low order bits have been

updated).

With respect to claim 5, Dowdell discloses the three-dimensional shape drawing

device according to claim 1, wherein when the result of the comparison performed by

the low order bit comparing section shows that the low order bits calculated by the

depth value calculation section have the same value as that of the low order bits

retained by the low order Z-buffer memory, the high order bit comparing section

performs, for a next pixel, a comparison of high order bits of depth values (column 3,

lines 38-42, updating operation is performed for a given pixel, and continues to the next pixel for until all pixels have been processed).

With respect to claim 7, Dowdell discloses the three-dimensional shape drawing device according to claim 1, further comprising: a high order Z-buffer clearing section for initializing the depth value retained by the high order Z-buffer memory; and a low order Z-buffer clearing section for initializing the depth value retained by the low order Z-buffer memory (column 4, lines 27-31, new z-value is compared to a constant value, thus the depth value must have been initialized to said constant value, which includes the high order and low order bits).

With respect to claim 8, Dowdell discloses the three-dimensional shape drawing device according to claim 1, wherein when the depth indicated by the high order bits of the depth value calculated by the depth value calculation section is determined to be shallower than the depth indicated by the high order bits of the depth value retained by the high order Z-buffer memory, the high order bit comparing section adds a flag to the high order bits of the depth value calculated by the depth value calculation section, when the depth indicated by the low order bits of the depth value calculated by the depth value calculation section is determined to be shallower than the depth indicated by the low order bits of the depth value retained by the low order Z-buffer memory, the low order bit comparing section adds a flag to the low order bits of the depth value calculated by the depth value calculation section, when the flag is added to the high order bits of the depth value calculated by the depth value calculation section, the record update section updates the high order bits of the depth value retained by the

high order Z-buffer memory and the low order bits of the depth value retained by the low

order Z-buffer memory, and when the flag is added to the low order bits of the depth

value calculated by the depth value calculation section, the record update section

updates either only the low order bits of the depth value retained by the low order Z-

buffer memory or both the high order bits of the depth value retained by the high order

Z-buffer memory and the low order bits of the depth value retained by the low order Z-

buffer memory (column 4, lines 61-68, column 5, lines 1-41). It is noted that Dowdell

does not explicitly disclose the use of a "flag" for signifying when to update the high

order and low order bits; however, a flag is merely a variable associated with the result

of the comparison of the high and low order bits. Therefore, Dowdell discloses using at

least a variable for determining whether further bits are retained as by the "done" state

in Fig. 2.

With respect to claim 12, Dowdell discloses a three-dimensional shape drawing

method for drawing a three-dimensional shape by using Z buffer algorithm, the three-

dimensional shape drawing method comprising the steps of: calculating a depth value of

a pixel to be drawn (column 3, lines 52-55, calculated from computer); reading, from a

high order Z-buffer memory retaining high order bits of a depth value of a pixel to be

displayed as a front face, the high order bits, the depth value being among depth values

having been calculated at the step of calculating a depth value (column 4, lines 45-50,

most significant bits), and comparing the high order bits having been read with high

order bits of the depth value calculated at the step of calculating a depth value (column

4, lines 61-68, column 5, lines 1-14, comparing most significant byte); when the high

order bits of the depth value calculated at the step of calculating a depth value are

determined, at the step of comparing the high order bits, to have a same value as that

of the high order bits of the depth value retained by the high order Z-buffer memory,

reading, from a low order Z-buffer memory retaining low order bits of the depth value of

the pixel to be displayed as the front face, the low order bits, the depth value being

among the depth values having been calculated at the step of calculating a depth value,

and comparing the low order bits having been read with low order bits of the depth

value calculated at the step of calculating a depth value (column 5, lines 15-27); and

updating the high order bits of the depth value retained by the high order Z-buffer

memory and the low order bits of the depth value retained by the low order Z-buffer

memory by using the depth value calculated by the step of calculating a depth value

when a depth indicated by the high order bits of the depth value calculated at the step of

calculating a depth value is determined, at the step of comparing the high order bits, to

be shallower than a depth indicated by the high order bits of the depth value retained by

the high order Z-buffer memory (column 5, lines 5-10), and updating the low order bits

retained by the low order Z-buffer memory by using the depth value calculated at the

step of calculating a depth value when a depth indicated by the low order bits of the

depth value calculated at the step of calculating a depth value is determined, at the step

of comparing the low order bits, to be shallower than a depth indicated by the low order

bits of the depth value retained by the low order Z-buffer memory (column 5, lines 16-

23).

With respect to claim 13, Dowdell discloses the three-dimensional shape drawing method according to claim 12, wherein when, at the step of comparing the low order bits, the low order bits calculated at the step of calculating a depth value are determined as having a same value as that of the low order bits retained by the low order Z-buffer memory, the low order bits retained by the low order Z-buffer memory are updated (column 5, lines 38-41, in the case where the old 24 bit z-value is equal to the new 24 bit z-value, the new value is equal to the old value and already written to memory, thus the low order bits have been updated).

With respect to claim 14, Dowdell discloses the three-dimensional shape drawing method according to claim 12, wherein when, at the step of comparing the low order bits, the low order bits calculated at the step of calculating a depth value are determined as having a same value as that of the low order bits retained by the low order Z-buffer memory, a comparison of high order bits of depth values is performed for a next pixel ((column 3, lines 38-42, updating operation is performed for a given pixel, and continues to the next pixel for until all pixels have been processed).

With respect to claim 15, Dowdell discloses the three-dimensional shape drawing method according to claim 12, further comprising the steps of: initializing the depth value retained by the high order Z-buffer memory; and initializing the depth value retained by the low order Z-buffer memory (column 4, lines 27-31, new z-value is compared to a constant value, thus the depth value must have been initialized to said constant value).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

Claims 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Dowdell (U.S. Patent No. 5,301,263).

With respect to claims 9-10, Dowdell discloses the device of claims 1 and 9,

respectively. However, Dowdell does not expressly disclose the high order z-buffer

memory and the low order z-buffer memory are physically separable, and wherein the

low order z-buffer memory is physically separable from the three-dimensional shape

drawing device.

At the time of the invention was made, it would have been an obvious matter of

design choice to a person of ordinary skill in the art to modify Dowdell to use memory

that is physically separable because Applicant has not disclosed that using physically

separable memory provides an advantage, is used for a particular purpose, or solves a

stated problem. One of ordinary skill in the art, furthermore, would have expected

Applicant's invention to perform equally well with using one memory (Applicant's

specification, page 25, paragraph 58) because the high order bits and low order bits are

separately recorded at different addresses in one memory.

Therefore, it would have been an obvious matter of design choice to modify

Dowdell to obtain the invention as specified in claims 9-10.

Claims 6 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Dowdell (U.S. Patent No. 5,301,263) in view of Andrews (U.S. Patent No. 7,030,887).

With respect to claim 6, Dowdell discloses the three-dimensional shape drawing

device according to claim 1, further comprising a high order Z-buffer clearing section for

initializing the depth value retained by the high order Z-buffer memory with a

predetermined value (column 4, lines 27-31, new z-value is compared to a constant

value, thus the depth value must have been initialized to said constant value). However,

Dowdell does not expressly disclose, wherein the predetermined value indicates a

shallowest depth or a deepest depth.

Andrews, who also deals with using a z-buffer, discloses a method for initializing

a z-buffer to its smallest value (column 11, lines 13-18).

Dowdell and Andrews are in the same field of endeavor, namely computer

graphics.

At the time of the invention, it would have been obvious to one skilled in the art to

initialize a z-buffer to its smallest value, which indicates shallowest depth, as taught by

Andrews because this would provide a boundary value for performing a depth

comparison.

With respect to claim 16, Dowdell discloses the three-dimensional shape drawing

method according to claim 12. However, Dowdell does not expressly disclose further

comprising the step of initializing the depth value retained by the high order Z-buffer

memory with a predetermined value, wherein the predetermined value indicates a

shallowest depth or a deepest depth.

Andrews, who also deals with using a z-buffer, discloses a method for initializing a z-buffer to its smallest value (column 11, lines 13-18).

Dowdell and Andrews are in the same field of endeavor, namely computer graphics.

At the time of the invention, it would have been obvious to one skilled in the art to initialize a z-buffer to its smallest value, which indicates shallowest depth, as taught by Andrews because this would provide a boundary value for performing a depth comparison.

Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dowdell (U.S. Patent No. 5,301,263) in view of Narayanaswami (U.S. Patent No. 6,160,557).

With respect to claim 11, Dowdell discloses the device of claim 1. However, Dowdell does not expressly disclose the memory storing at least either one of high order bits and low order bits, the high order bits and the low order bits being separated as different bit strings.

Narayanaswami, who also deals with using a z-buffer, discloses a method for using a bit string (column 10, lines 3-14).

Dowdell and Narayanaswami are in the same field of endeavor, namely computer graphics.

At the time of the invention, it would have been obvious to one skilled in the art to combine the method of using a bit string for storing data as taught by Narayanaswami with the Dowdell reference, because this would facilitate comparing bits of data.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U.S. PGPUB 20030160788 to Buehler for a method of setting a flag for each pixel that passes a minimum depth test

U.S. Patent No. 6,680,737 to Ashburn et al. for a method of performing a depth comparison between colliding pixels.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANDREW YANG whose telephone number is (571)272-5514. The examiner can normally be reached on 8:30-5 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ulka Chauhan can be reached on (571)272-7782. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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7/22/09

/Daniel F Hajnik/
Examiner, Art Unit 2628